

---

A N N A L E S  
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA  
LUBLIN – POLONIA

VOL. LIV, 1

SECTIO H

2020

---

IGOR YAREMKO

ihor.y.yaremko@lpnu.ua

Lviv Polytechnic National University. Institute of Economics and Management

5 Mytropolyta Andreia St., 79013, Lviv

ORCID ID: <https://orcid.org/0000-0003-3556-0609>

LIUBOMYR PYLYPENKO

liubomyr.m.pylypenko@lpnu.ua

Lviv Polytechnic National University. Institute of Economics and Management

5 Mytropolyta Andreia St., 79013, Lviv

ORCID ID: <https://orcid.org/0000-0003-4306-7531>

OLENA TYVONCHUK

olena.i.tyvonchuk@lpnu.ua

Lviv Polytechnic National University. Institute of Economics and Management

5 Mytropolyta Andreia St., 79013, Lviv

ORCID ID: <https://orcid.org/0000-0001-5524-6516>

*Accounting for Obsolescence in Providing Company  
Capital Preservation*

**Keywords:** accounting; financial reporting; obsolescence; capital; reserve

**JEL:** M41; M48; G32

**How to quote this paper:** Yaremko, I., Pylypenko, L., & Tyvonchuk, O. (2020). Accounting for Obsolescence in Providing Company Capital Preservation. *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, Vol. 54, No. 1.

### Abstract

**Theoretical background:** The dynamic development of modern-day economies causes a rapid obsolescence of economic resources that leads to a reduction in companies' total capital. Current accounting methodology does not provide clear procedures for relevant measurements and reflections on obsolescence in financial reporting.

**Purpose of the article:** The purpose of the paper is to develop a relevant accounting methodology for objective representation of a company's assets and capital value in financial reporting as well as preventing the loss of capital due to obsolescence.

**Research methods:** This paper critically reviews the extant literature and international accounting standards. The proposed methodology is based on the concepts of capital maintenance (physical and financial) and the approach of replacement assets value, originally formulated by Schmidt (1921) in their organic balance theory.

**Main findings:** The main result of the paper is substantiated reasonableness of relevant reflection of obsolescence in accounting and financial reporting through a specially created account – reserve for capital stock obsolescence with retained earnings as a main source of its formation. The application of the proposed *ex-ante* approach ensures the preservation of productive energy of capital and the possibility of its reproduction in a qualitatively new (innovative) technical and technological form.

### Introduction

The dynamics of the modern economy engendered by scientific and technological advances and the rapid pace of their implementation can cause rapid obsolescence of economic goods and the means for their production. The phenomenon of obsolescence in economics was known as far back as the 19<sup>th</sup> century. In particular, it was described by Marx in his work *Capital: A Critique of the Political Economy* (1867). However, obsolescence only really became significant in the 21<sup>st</sup> century, in the post-industrial era of the global economy. If, during the industrial age, obsolescence resulted primarily from the emergence of cheaper, more productive or less resource-consuming capital goods, obsolescence nowadays is driven by the fundamental shift in functional nature of economic (consumer) goods as well as in the methods and technologies involved with their production.

The extent of the economic impact of obsolescence is apparent in the economic failures of transnational corporations (e.g., Nokia), collapses of commodity markets and the disappearance of entire industries. Its pace can be so rapid that sometimes the determination and accounting for physical deterioration can even lose economic sense. Despite the general acknowledgement of the issues, the problem of obsolescence and its impact on companies' capital stock value still remains mainly unresolved. This paper presents an attempt to develop a practical accounting tool aimed at providing relevant recognition of obsolescence and representation of companies' capital in financial reporting that would ensure its preservation from the value loss brought on by obsolescence.

### **The essence of obsolescence, its features and impact in the modern economic conditions**

The topic of obsolescence had been an important subject of research both in the industrial and post-industrial period of economic development. Many studies (including Boucekkine, del Rio, & Martinez, 2009; Diewert & Wykoff, 2006; Escribá-Pérez, Murgui-García, & Ruiz-Tamarit, 2019; Freeman, 2009; Gort & Wall, 1998; Hill, 1999; Musso, 2006; Oulton, 1995) consider the concepts of depreciation and obsolescence as important variables for capital measurement in the system of national economic accounts, and highlight the problems of obsolescence recognition and measurement. The general issues of the nature, economic impact, features and types of capital depreciation and obsolescence were also investigated by Michalchuk (2005), Ilyashenko and Livatska (2007), and Yefimenko (2010) among others.

The complex nature of obsolescence impedes attempts to formulate a concise yet comprehensive (full and meaningful) definition of this concept. Generally, obsolescence is considered to be a reduction or economic deterioration in asset values as a result of technology development, change in users demands, preferences, etc. As a phenomenon, it can be expressed in economic, functional and environmental dimensions (Moskvin, 2013).

Gort and Wall (1998) stated that physical deterioration refers primarily to machinery and equipment, while obsolescence refers more to computers and high-tech equipment. At the same time, the rate of depreciation of physical capital should be determined by a combination of physical wear and obsolescence.

Mansfield and Pinder (2008) pointed out that depreciation is a function of two distinct processes: physical deterioration and obsolescence. They emphasise, however, that physical deterioration of property values and capital is property-specific but is generally predictable and could be slowed down by capital expenditures on maintenance. In contrast, obsolescence is unpredictable, meaning that it should not be considered in the same manner as depreciation (Grover & Grover, 2015). Among factors of property-based obsolescence, such issues as purely physical structure (origin) of the object, the location and its environment, the statutory and regulatory framework, as well as subjective and aesthetic factors can be determined. Furthermore, the authors have found that the impact of obsolescence may be hidden by high levels of inflation and high nominal growth rates.

It should be noted that researchers such as Mansfield and Pinder (2008), Baum (1991) and Reed and Warren-Myers (2010) have examined obsolescence in the applied aspect, with regard to the property values that determine the peculiarity of identified factors of their moral aging. In fact, the issue of real estate (especially commercial) obsolescence remains a relatively urgent one for modern scientists. In particular, Pomykacz (2009), on the basis of macroeconomic data empirical analysis, highlighted an inverse relationship between any entrepreneurial profit and incentive and any external obsolescence of real estate.

On the other hand, the International Valuation Standards (IVS) (2017) does not state a clear difference between depreciation and obsolescence. Addressing depreciation within the context of the cost approach to assets valuation, IVS defines it as "(...) adjustments made (...) to reflect the impact on value of any obsolescence affecting the subject asset". Along with functional and economic (external) types of obsolescence, IVS also distinguishes physical obsolescence caused by physical deterioration due to the assets (or its components), age and usage.

According to OECD Manual Measuring Capital (2009) depreciation comprises only foreseeable (or normal) obsolescence. Therefore, unforeseen (or abnormal) obsolescence that can be caused by technological shifts or changes in the relative prices of inputs is not considered to be a part of depreciation and is regarded on the same basis as a loss of assets due to wars or natural disasters. Freeman (2009) argued that the full effect of moral depreciation (obsolescence) does not immediately become evident; and therefore, for a certain period of time (for at least as long as the duration of the business cycle or even longer) the official financial data on companies' performance cannot be fully relevant. He gives clear examples of how the failure to take into account the phenomenon of obsolescence has led to the bankruptcies of large companies and even entire industries (in particular, the British shipbuilding industry). The author also emphasises that moral depreciation and its impact on capital is not a statistical or accounting fiction, but "a real phenomenon of capitalism" (Freeman, 2009, p. 13).

Boucekkine, del Rio, and Martinez (2009), based on their empirical analysis of the economic depreciation rate of equipment and software since 1960, concluded that it is not constant and depends, to a large extent, on the pace of technological evolution. As a result, the lifetime of a company's capital is also highly dependent on scientific and technological progress.

### **Obsolescence in the system of accounting: State of the art**

Obsolescence of capital stock is the result of the premature decrease in the ability of its items to generate economic benefits. For the purposes of this paper, we consider capital stock (or fixed capital) to be the proportion of the total capital invested in fixed assets, both tangible and intangible, such as software (Ahmad, Aspden, & Schreyer, 2005). In a post-industrial economy, not only is the tangible part of a company's fixed assets (machinery, equipment) subject to obsolescence but their intangible components (such as intangible assets, unrecognised intellectual assets presented in the accounting system in the form of goodwill, or the cost of research and development, etc.) are also vulnerable. Thus, the capital (either completely or partially) can lose its productive energy.

Obsolescence can impact on many different industries and has become a significant problem in the electronics industry (electronics, electromechanical and electrical components) due to rapid technological development. However, an even

more urgent issue today is the problem of software obsolescence, which could even occur during the software's development and target environment, and can affect skills, COTS software and media (Romero-Rojo, Roy, Shehab, Cheruvu, Blackman, & Rumney, 2010). It is essential, therefore, to establish appropriate methods and tools of obsolescence management and mitigation strategies (Bartels, Ermel, Pecht, & Sandborn, 2012; Romero-Rojo, et al., 2010; Sandborn, 2007), as well as to develop relevant accounting methodology and procedure of recording obsolescence and its reflection in financial reporting.

Despite the clearly applicable nature of the accounting science, the accounting issues of obsolescence have been revealed rather modestly, both in imperative regulatory documents and in scientific research works. In particular, International Accounting Standard 16 *Property, Plant and Equipment* (2003) stated that obsolescence is only one of the factors that have to be considered in determining the useful life of fixed assets. International Accounting Standard 36 *Impairment of Assets* (2004) specified indications as to when an asset may be impaired (because, but not necessarily, of obsolescence) and defined the requirements for reducing the carrying amount of such assets by the amount of impairment and write off losses that arise at the same time. Such impairment loss is recognised as an expense (except that it relates to a revalued asset where the impairment loss is treated as a revaluation decrease).

Already in the mid-20<sup>th</sup> century, Green and Sorter (1959) considered equipment obsolescence with regard to the necessity of relevant depreciation rate determination and income measurement. The technique, proposed by the authors, implies the creation of a special allowance for depreciation account. It was assumed to create such an allowance (reserve) only after the determination of obsolescence by debiting past period profits or retained earnings. From the point of view of achieving the objectivity of operational efficiency, such an approach is consistent with the concept of income management. This can be regarded as logical when considering the period of an article's publication. However, allowance for depreciation is not essentially a reserve; instead, it is a regulatory account designed to write off the excessive depreciation (the amount of accumulated depreciation, on the condition of the impairment of obsolete object of fixed asset, should be factually less) and the revenue lost from obsolete fixed assets disposal.

The main drawback of Green and Sorter's (1959) approach, as well as of other accounting methods elaborated at that time (e.g., Hashim, 1972; Wright, 1965), is that it actually implies *ex-post* considerations and estimations of obsolescence. However, after the unpredictably rapid moral depreciation of fixed capital, the company could still go bankrupt and such an approach might ultimately turn out to be useless as it does not provide preventative mechanisms for preserving a company's capital from reduction due to obsolescence. Thus, at present, the problem of capital obsolescence remains unresolved, but is extremely relevant.

The analysis of financial reporting of leading technology companies for 2013–2017 (the sample covered Apple Inc., Alphabet Inc. (Google), Facebook Inc., Mi-

crosoft, the Volkswagen Group, Vodafone Group Plc and Tesla Motors Inc.) has revealed that their accounting policies mostly do not take capital obsolescence into consideration. In particular, Apple's financial reporting (Apple, 2018) includes two notes on obsolescence, but they both refer to the inventory rather than to fixed assets or technology, namely that 1) the company provides the write-off of finished goods and other obsolete inventories; and 2) the report includes comments on the industry in which the company competes. In addition, the rapid and unpredictable obsolescence of products and components and the changes in demand, typical for the industry, may adversely affect a company's financial position and their operational results. The same can be observed in the financial reporting of Vodafone (2018), whose notes specify only that value of inventories is shown net of impairment losses. These facts could indicate that despite the awareness of obsolescence and the importance of its impact, financial managers and accountants can only *ex-post-facto* write off losses resulting from it. Existing accounting methodology does not have relevant mechanisms for effectively preserving capital from this phenomenon.

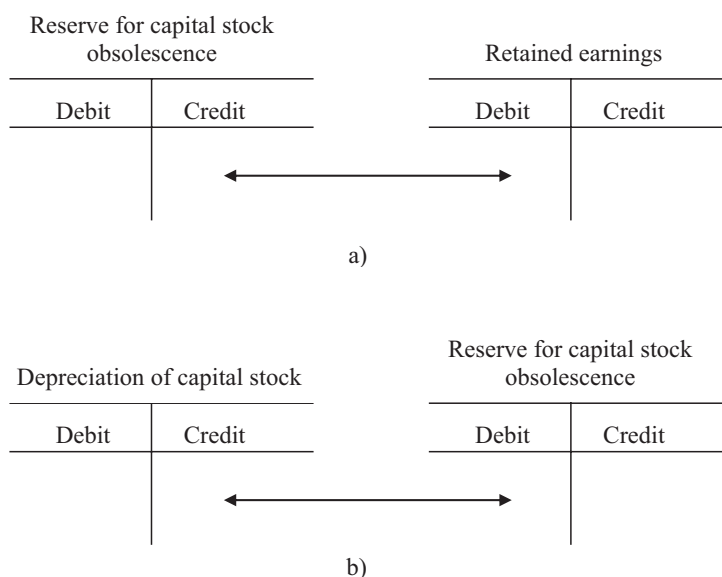
#### **Accounting for obsolescence and company's capital preservation: An *ex-ante* approach**

The inability to solve the problem of obsolescence in the framework of the existing accounting tools necessitated a scientific search at the conceptual and methodological level. The analysis of the above-mentioned scientific publications enables us to make some conclusions, which is essential for the development of accounting methodology for fixed assets obsolescence. One conclusion is that obsolescence may be the result of many factors that are sometimes quite unpredictable. Therefore, it is impossible to foresee its occurrence or to know how much it will affect a company. This conclusion is an important argument in substantiating the method of estimating obsolescence in the accounting system.

Uncertainty and unpredictability of obsolescence necessitate the application of a particular mechanism of reserving (allowance) in order to protect the owner's capital from a reduction in value due to obsolescence. This mechanism should, first of all, be directed towards the preservation of capital in order to perform a preventive-protective function rather than a regulatory one.

The theoretical and methodological grounding for the reflection of obsolescence and reserve created to cover obsolescence losses in the system of accounting and financial reporting was suggested by Pylypenko (2016). The mechanisms of accounting representation of obsolescence are based on the fundamental concepts and theories of accounting, namely the concepts of capital maintenance (physical and financial) and organic balance theory. This fundamental basis has made it possible to substantiate the feasibility of the replacement value approach in accounting methodology. The practical application of such an approach in the conditions of the information-in-

tellectual economy is aimed at protecting capital from reductions in value not only due to the market conditions, inflationary processes or physical deterioration but also because of potential obsolescence. As a result of this approach, we propose to charge technological obsolescence in accounting by means of a specially created reserve – a reserve for obsolescence of capital stock (Figure 1).



**Figure 1.** Representation of obsolescence in the accounting system: a) formation of a reserve for capital stock obsolescence; b) obsolescence charged through the creation of a reserve

Source: Authors' own study.

An important methodological issue when accounting for obsolescence is its measurement. Mansfield and Pinder (2008) pointed out that obsolescence is strongly related to a decline in the usefulness of an asset. In the authors' opinion, one way of measuring the amount of functional type might be by the cost of replacing an obsolete product with a new one (depreciated replacement cost). From the standpoint of the physical concept of capital, the principle of substitution in the measurement of obsolescence could be both appropriate and relevant. However, from the financial concept of a capital point of view, its potential application is rather controversial as the cost of replacing an obsolete asset is always higher than its carrying amount. In other words, the accumulated obsolescence that exceeds the carrying amount of the asset could create objects with a negative value in a company's accounting and balance sheet. Eventually, certain physical assets have salvage value due to their material form (for example, the value of outdated equipment as a scrap metal). Therefore, an assessment of an asset's potential obsolescence in accounting should be carried out, taking into account the possibilities for its further use.

The estimation of the reserve for capital stock obsolescence focuses primarily on determining its optimal amount. In accounting, the majority of reserves are accrued based on the events of past reporting periods (provisions for leave, doubtful debts, etc.). The application of such a retrospective approach may be reasonable for establishing an optimal amount of accounting reserves for covering losses from systematic risks. Taking into account the unpredictability of obsolescence, it acts as a source of non-systematic unforeseen risk. Therefore, the use of a retrospective approach in order to determine the optimal reserve for capital obsolescence is unacceptable.

One of the possible solutions to the problem of estimating the reserve for capital stock obsolescence is the imperative determination of its optimal amount – shifting the problem from the level of accounting methodology to that of fiscal policy. In this case, such reserves could be evaluated by experts who would have to take a large number of factors into consideration, such as the sector factor, the level of innovative development of the market and company, and many other factors of external environment as well as the level of risk to the company's financial policy.

## Conclusions

On the basis of this study, it was found that obsolescence of the company's capital stock leads to a decline in its (capital) productive energy – otherwise known as a reduction. Therefore, on the one hand, the methodology of accounting procedures for the recognition of capital stock obsolescence should ensure the objective reflection of assets and capital in the system of accounting and financial reporting, while on the other hand they should be aimed at preserving the company's financial capital. Given the unpredictability of obsolescence, the feasibility of introducing a relevant reserve in the methodology of its accounting is substantiated. It was reasoned that such practical accounting procedures will enable the preservation of productive energy of capital and the possibility of its reproduction in a qualitatively new (innovative) technical and technological form. The application of the proposed *ex-ante* approach provides for the creation of an appropriate account “Reserve for capital stock obsolescence”. Suggested methods for the estimation of the reserve are based on the company's financial policy.

## References

- Ahmad, N., Aspden, C., & Schreyer, P. (2005). Obsolescence and depreciation. *Paper prepared for the meeting of the Canberra Group on Non-Financial Assets*, Canberra.
- Apple. (2018). Apple. Investor Relations. *Financial Information*. Retrieved from <https://investor.apple.com/investor-relations/financial-information/default.aspx>
- Bartels, B., Ermel, U., Pecht, M., & Sandborn P. (2012). *Strategies to the Prediction, Mitigation and Management of Product Obsolescence*. Hoboken: John Wiley & Sons. doi:10.1002/9781118275474



- Baum, A. (1991). *Property investment depreciation and obsolescence*. London: Routledge.
- Boucekkine, R., del Río, F., & Martínez, B. (2009). Technological progress, obsolescence, and depreciation. *Oxford Economic Papers*, 61(3), 440–466. doi:10.1093/oeq/gpn016
- Diewert, E., & Wykoff, F. (2006). Depreciation, deterioration and obsolescence when there is embodied or disembodied technical change. *Department of Economics Discussion Paper Series*, University of British Columbia.
- Escribá-Pérez, F.J., Murgui-García, M.J., & Ruiz-Tamarit, J.R. (2019). Capital stock and depreciation: theory and an empirical application. *Discussion Papers*, No. 2019004. Institut de Recherches Economiques et Sociales, Université Catholique de Louvain.
- Freeman, A. (2009). What makes the US profit rate fall? *MPRA Paper*, No. 14147, March 19, 2009. Retrieved from <https://mpra.ub.uni-muenchen.de/14147/>
- Gort, M., & Wall, R.A. (1998). Obsolescence, input augmentation, and growth accounting. *European Economic Review*, 42(9), 1653–1665. doi:10.1016/S0014-2921(97)00108-6
- Green, D., & Sorter, G. H. (1959). Accounting for obsolescence. A proposal. *The Accounting Review*, 34(3), 433–441.
- Grover, R., & Grover, C., (2015). Obsolescence: A cause for concern? *Journal of Property Investment & Finance*, 33(3), 299–314. doi:10.1108/JPIF-02-2015-0016
- Hashim, J. M. (1972). Capital consumption: National vs. business accounting points of view. *International Statistical Review/Revue Internationale de Statistique*, 40(1), pp. 53–65.
- Hill, P. (1999). Capital stocks, capital services and depreciation. *Paper presented at the third meeting of the Canberra Group on Capital Stock Statistics*. Washington, D.C.
- Ilyashenko, T.O., & Livatska, T.M. (2007). Znos yak dzherelo onovlennya, formuvannya ta funkcionuvannya osnovnoho kapitalu ta shlyakhy yoho pokrashchannya [Depreciation as a source of renewal, formation and operation of fixed capital and ways to improve it]. *Sumy State University Journal. Economic Sciences*, 1, 136–142 (in Ukrainian).
- Impairment of Assets. (2004). International Accounting Standard No. 36. Retrieved from <https://www.iasplus.com/en/standards/ias/ias36>
- International Valuation Standards (IVS). (2017). International Valuation Standards Council, London.
- Mansfield, J.R., & Pinder, J.A. (2008). ‘Economic’ and ‘functional’ obsolescence. Their characteristics and impacts on valuation practice. *Property Management*, 26(3), 191–206. doi:10.1108/02637470810879233
- Marx, K. (1867) [2004]. *Capital: A Critique of Political Economy*. London: Penguin Books.
- Michalchyk, L. (2005). Umorzenie a amortyzacja w aspekcie rachunkowości ochrony obrotu gospodarczego. In: B. Micherda (red.), *Rachunkowość w ochronie obrotu gospodarczego*. Kraków: Wydawnictwo Akademii Ekonomicznej.
- Moskvin, Y. A. (2013). Innovatsionnaya ekonomika i poyavlenie novykh form moral'nogo iznosa osnovnogo kapitala [Innovative economy and the emergence of the new forms of obsolescence of fixed capital], *MIR. Modernization. Innovation. Research*, 16, 68–72 (in Russian).
- Musso, P. (2006). Capital obsolescence, growth accounting and total factor productivity, *Revue de l'OFCE*, 97(5), 217–233. doi:10.3917/reof.073.0217
- OECD. (2009). *Depreciation or Consumption of Fixed Capital, in Measuring Capital – OECD Manual 2009*, 2<sup>nd</sup> edition, OECD Publishing. doi:10.1787/9789264068476-8-en
- Oulton, N. (1995). Depreciation, obsolescence and the role of capital in growth accounting. *Bulletin of Economic Research*, 47(1), 21–33. doi:10.1111/j.1467-8586.1995.tb00598.x
- Pomykacz, M. (2009, Fall). Defining and supporting entrepreneurial profit, entrepreneurial incentive, and external obsolescence. *The Appraisal Journal*, 348–355.
- Property, Plant and Equipment. (2003). International Accounting Standard No. 16. Retrieved from <https://www.iasplus.com/en/standards/ias/ias16>
- Pylypenko, L. M. (2016). *Rozvytok kontseptsii pobudovy systemy publichnoi zvitnosti korporatsii v umovakh postindustrialnoi ekonomiky* [Development of the concepts of corporate reporting system formation in post-industrial economy]. Lviv: Lviv Polytechnic Publishing House (in Ukrainian).

- Reed, R. & Warren-Myers, G. (2010). Is sustainability the 4th form of obsolescence? In: *PRRES 2010: Proceedings of the Pacific Rim Real Estate Society 16<sup>th</sup> Annual Conference*, Pacific Rim Real Estate Society (PRRES), Wellington, New Zealand.
- Romero-Rojo, F.J., Roy, R., Shehab, E., Cheruvu, K., Blackman, I., & Rumney, G.A. (2010). Key challenges in managing software obsolescence for industrial product-service systems (IPS2). In: *Proceedings from the 2nd CIRP IPS2 Conference*, Sweden, 14–15 April 2010, pp. 393–398.
- Sandborn, P. (2007). Designing for technology obsolescence management. In G. Bayraksan, W. Lin, Y. Son, and R. Wysk (Eds.), *Proceedings of the 2007 Industrial Engineering Research Conference*. Norcross, GA: Institute of Industrial Engineers, pp. 1684–1689.
- Schmidt, F. (1921). *Die organische Bilanz im Rahmen der Wirtschaft*. Leipzig: Gloeckner.
- Vodafone (2018). *Annual Report*. Retrieved from [https://www.vodafone.com/content/index/investors/investor\\_information/annual\\_report.html](https://www.vodafone.com/content/index/investors/investor_information/annual_report.html)
- Wright, F.K. (1965). Depreciation and obsolescence in current value accounting. *Journal of Accounting Research*, 3(2), 167–181. doi:10.2307/2490290
- Yefimenko, N.A. (2010). Osoblyvosti vidtvorennia yakosti osnovnoho kapitalu yak ob'ektu upravlinnia [The features of reproduction of fixed assets' quality as a management object]. *Actual Problems of Economics*, 6(108), 110–117 (in Ukrainian).